

BERBERIS CLAIREAE, A NEW SPECIES FROM BAJA CALIFORNIA;
AND WHY NOT MAHONIA

Reid Moran

Natural History Museum, San Diego, California 92112

Two species of Berberis section Mahonia have been known from Baja California: *B. higginsiae* Munz and *B. pinnata* Lag.; and a new species quite different from these is made known below.

Berberis higginsiae is very close to *B. haematocarpa* Woot. and perhaps not distinct and is also close to *B. fremontii* Torr. Marroquín (1972) cited specimens of all three species from northern Baja California but without distinct ranges and sometimes two species from one locality. Although Benson and Darrow (1981) did not list *B. higginsiae* in the synonymy of *B. fremontii*, they did ascribe *B. fremontii* to Baja California and map it in southern San Diego County, in the type region of *B. higginsiae*. This complex clearly needs study. Baja Californian specimens are variable in leaf form and mostly lack the fruit that is supposed to help distinguish these species; but I tentatively call them all *B. higginsiae*. Under this view, *B. higginsiae* is common in the Sierra Juárez and less common on the west slope of the Sierra San Pedro Mártir, extending from 675 m near Ojos Negros to 1900 m at the summit of Cerro Chato. It grows most commonly with *Juniperus californica* Carr, often also with *Pinus quadrifolia* Parl., and sometimes with *P. jeffreyi* Grev. & Balf. Also, it is rare and doubtless relictual 175 km to the SSE, in the Sierra San Borja (Rancho Viejo, Brandege in 1889; Tinajas de la Chona, 800 m, Moran 12825).

According to Wiggins (1980:562), *B. pinnata* is occasional in the northern Sierra Juárez. The only Baja Californian collection I have seen, and the only one cited by Marroquín (1972), was made by Wiggins and Demaree (3995) in 1929 in a small box canyon with *Xylococcus*, *Rubus*, and *Plantanus*, 36 km north of Ensenada. From notes kindly sent by Dr. Wiggins and from labels on other collections, the place seems to be about 3 km SE of Rancho Jatay [or Guatay], where the road of that day climbed inland from the coast and started across the mesa towards Ensenada.

Berberis piperiana (Abrams) McMinn, as usually understood, grows in the coast ranges of northern California and southern Oregon. Munz (1959:107) reported it also as less common from the San Gabriel Mountains to San Diego County and Baja California; but later (1974:245) he omitted it from the flora of southern California, perhaps referring the southern specimens to *B. pinnata*. This complex also clearly needs study. Wiggins (1980:562) reported *B. piperiana* as rare in northern Baja California, at 900-1700 m. I have seen no Baja Californian specimens from this complex except for the one mentioned under *B. pinnata*; and Marroquín (1972) cited no other.

A third species of *Berberis*, described here as *B. claireae*, grows in a few canyons near the coast some 50 km south of Ensenada, below Eréndira. Fred Sproul brought this plant to my attention with a sterile

specimen collected in December 1977. I later found a sterile specimen (POM) collected in April 1925 by Marion Hill, a student at Pomona College. I have pursued this plant over the last four years.

Berberis or Mahonia?

Authors disagree whether to include Mahonia in Berberis or keep it a separate genus. In considering this question, Ernst (1964) pointed out that the two groups have much in common, including chromosome number, similar and somewhat unusual pollen, and susceptibility to wheat rust; and Ahrendt (1961) argued that no distinction can be made in petals or stamens, as some have tried to do. *Berberis* (*Mahonia*) *aquifolium* forms sterile hybrids with several species of *Berberis* s.s. Ahrendt and Ernst both wrote that *Mahonia* seems to differ consistently from *Berberis* s.s. only in having compound leaves. That way the distinction between them is simple and unequivocal, but is it natural? The leaves of *Berberis* s.s. are jointed at the base, much as the leaflets of *Mahonia* are jointed to the rachis and as the rachis itself is often jointed; and in one or more species of *Berberis* s.s., according to Ernst, the leaf is twice jointed. It thus appears that the simple leaf of *Berberis* s.s. is derived from the pinnate leaf of *Mahonia*. Is it certain that *Berberis*, separated only by simple leaves, is monophyletic?

The primary leaves in most species of *Berberis* s.s. are reduced to simple or branching spines and in a few others are transitional between leaves and spines; and the foliage leaves are crowded on axillary short shoots. Thus the character of simple leaves in *Berberis* s.s. usually is supported by the presence of spiniform primary leaves and of short shoots. However, at least *B. insignis* Hook f. & Thoms. and relatives, of the eastern Himalaya, have simple primary leaves and no spines or short shoots. The leaves are pinnately veined as in *Berberis* s.s. and like the leaflets of most American species of *Mahonia* but unlike those of (most?) Asian species. The question is whether these plants can be simple-leaved members of *Mahonia*, spoiling the one key character of a one-character genus? Or are they best called a third group more or less coordinate with the other two? Thus the distinction of *Mahonia* from *Berberis* remains unclear. Shifting species from one group to the other may perhaps make the groups more natural if less easily defined. For the present, however, *Mahonia* is hard to defend as a distinct natural group, and I prefer to keep it in *Berberis*.

Berberis claireae Moran, species nova.

Frutex glaber rhizomatosus 1 - 1.5 m altus, caule 1 - 3 cm crasso, ramulis hornotinis foliorumque rhachidibus muriculatis rubris. Folia 3 - 10 cm longa, foliolis plerumque 1 - vel 2 - jugis ellipticis apice vulgo obtusis 2 - 3 - plo longioribus quam latioribus coriaceis minute papillosis 2 - 6 cm longis 8 - 20 (-33) mm latis utroque latere 0 - 6 - spinoso-dentatis, nervibus e basi 3 - 5 subparallelis. Inflorescentia terminalis 2 - 8 cm longa 2 - 5 cm lata paniculata vel racemo reducta 5 - 50 florata, pedicellis gracilis 3 - 12 mm longis. Flores 5 - 7 mm lati necessario flavi. Sepala 9 vel 12, interioribus obovatis

4 - 5 mm longis. Petala 6 obovata 3 - 4 mm longa basi biglandulosa, glandibus nervalibus 0.5 - 1.0 mm longis. Stamina 6 dentata 1 - 1.5 mm longa. Pistillum breve stipitatum 1.5 - 2.0 mm longum, stigmatem 1 mm lato, ovulis 2. Bacca glauca ca. 5 mm longa et 4 mm crassa. Holotypus: Moran 30011 (SD 110283). Inter species turmae Occidentalium in America occidentali nervatura palmata foliolorum suorum statim dignoscenda est. In hoc signo *B. gracili* similis est, sed foliolibus paucioribus (etiam solitariis) angustioribus magisque coriaceis, pedicellis longioribus, styliis brevioribus, fructibus parvioribus, seminibus tantum duobus differt.

Stiff glabrous rhizomatous shrub 8 - 16 dm tall, usually crowded and then with narrow crown and few lower branches. Stems erect, solitary or few-branched from base, 1 - 2 (-3) cm thick, the bark smoothish, light gray; twigs terete, muriculate, dark red, in age gray. Rhizomes often 1 dm below ground, to 1 m or more long, at first light yellow and 1.5 - 3 mm thick, later brown and 3 - 5 mm thick, the internodes ca. 5 - 15 mm long, each node at first with thin brownish triangular scale 4 - 5 mm long. Bud scales triangular, 2 - 5 mm long, 2 - 4 mm wide, dark red. Leaves 3 - 7 (-10) cm long, 2 - 6 (-10) cm wide, commonly 3- or 5-foliolate sometimes 1- to 7-foliolate; petiole and rachis bright red becoming dark, muriculate, sometimes persisting after fall of leaflets, the petiole 2 - 10 (-27) mm long, ca. 0.5 mm thick, broadened to sheathing triangular base ca. 2 - 4 mm wide with thin margins bearing stipular cusps to 1 mm long; leaflets sessile, conspicuously jointed to rachis, coriaceous, at first often red but soon deep green, somewhat lustrous, paler beneath, minutely low-papillose especially dorsally, nearly plane or slightly convex dorsally, mostly elliptic, ca. 2 - 3 times longer than wide, obtuse to broadly acute at base and apex, spinose tipped, 2 - 4 (-6) cm long, 8 - 20 (-33) mm wide, the terminal one usually largest, the margins thickened, colorless, slightly revolute, entire or mostly with 1 - 6 ascending to spreading slender but strong acicular teeth 0.5 - 3 mm long, slightly convex to slightly incurved between teeth, the main veins 3 or 5 from base, subequal, subparallel, often flexuous, slightly projecting ventrally. Inflorescence 2 - 5 (-8) cm long, 2 - 5 cm wide, a sessile terminal panicle with sometimes several spreading racemose or compound branches and up to 50 or more flowers, or reduced to simple raceme with as few as 5 flowers; primary bracts deciduous by anthesis. Pedicels 3 - 12 mm long, ca. 0.3 mm thick, tipped with persistent discate receptacle ca. 1 mm wide, with pair of small acuminate bracteoles near middle or below. Flowers mostly February to April, a few to June, bright yellow, ca. 5 - 7 mm wide. Sepals 9 or 12, the outer ovate to suborbicular, broadly acute to rounded, 1.5 - 2 mm long, the inner obovate, cupped, 4 - 5 mm long, 2.5 - 3 mm wide, 3-veined. Petals 6, obovate, cupped, rounded to emarginate, 3 - 4 mm long, 1.5 - 2 mm wide, 3-veined, with glands ca. 0.5 - 1.0 mm long and a third as wide along lower part of outer veins and so on either side of filament. Stamens 6, epipetalous, 1.5 - 2.5 mm long, the anther ca. 1 mm long, truncate above, with tooth on each side below. Pistil ovoid, short stipitate, 1.5 - 2 mm long, the capitate stigma sessile, 1 mm wide, the ovules 2. Berries few per inflorescence, to 5 mm long and 4 mm thick, glaucous, yellowish green becoming reddish but not

seen fully ripe; in October shriveled, hard, brown.

Type Collection: Common on south arroyo bank and lower north-facing slope, Arroyo Hediondo 1.5 km from the mouth, 50 m elevation, 5 km SE of Eréndira, Baja California Norte, Mexico (near 30° 14.3'N, 116° 20.4 'W), 7 March 1982, Moran 30011 (Holotype: SD 110283; isotypes to go).

Distribution: Baja California Norte: Known only from canyons between 5 and 20 km + SE of Eréndira and within 5 km of the coast, at elevations of 25 - 75 m. Collections (SD unless otherwise noted): Arroyo Hediondo, 50 - 75 m, M28150, 28669, 30014; 0.5 km SSE of Peñasco la Lobera, 30 m, (M26553, 26591, 27159, 27639, 28028; 2 km W of Cerro Solo, 50 m, Sproul 237, M27161, 27166; 2.5 km S of Cerro Solo, 30 m, M27191; Arroyo San Antonio and tributaries, 25 - 50 m, M27618, 27637, 30051, 30056; San Antonio Canyon, "500 ft.", M. Hill 127 (POM).

This species is named for Claire Brey, who greatly helped in exploring for it.

Despite some searching in likely areas both north and south, I have thus far found *B. claireae* only in a few canyons from Arroyo Hediondo, 5 km SE of Eréndira, to Arroyo San Antonio above Rancho San Antonio del Mar (Johnson Ranch) - a span of 15 km. It grows best at the foot of north slopes in the larger of these small canyons, more commonly where the south canyon wall is higher or steeper. It is not found in the more xeric vegetation of south-facing slopes or on the north bank of the arroyo. Just back from the south bank it may be rather common in a fairly dense low scrub, especially with *Rhamnus insula* Kell., *Ribes viburnifolium* A. Gray, *Rhus integrifolia* (Nutt.) Brew. & Wats., and *Heteromeles arbutifolia* (Lindl.) M. Roem. Smaller plants sometimes grow higher on the slope. Less constant and sometimes less intimate associates include *Adenothamnus validus* (Brandege) Keck, *Aesculus parryi* A. Gray, *Agave shawii* Engelm. *Artemisia californica* Less., *Ceanothus thyrsoiflorus* Esch., *C. verrucosus* Nutt., *Cercocarpus minutiflorus* Abrams, *Cneoridium dumosum* (Nutt.) Hook. f., *Comarostaphylos diversifolia* (Parry) Greene, *Coreopsis maritima* (Nutt.) Hook., *Diplacus puniceus* Nutt., *Dudleya ingens* Rose, *Eriogonum fasciculatum* Nutt., *Eriophyllum confertiflorum* (DC.) A. Gray, *Galvezia juncea* (Benth.) Ball, *Lotus scoparius* (Nutt.) Ottley, *Malosma laurina* Nutt., *Pinus muricata* D. Don (especially forma *remorata* (Mason) Hoover), *Rosa minutifolia* Engelm., *Salvia brandegei* Munz, *S. munzii* Epl., *Simmondsia chinensis* (Link) Schneid., *Venegasia carpesoides* DC., and *Xylococcus bicolor* Nutt.

The limited range, in mesic habitats along the coast, suggests that *Berberis claireae* may be a relict retreating with the warming and drying of the climate. I sent a leaf to Dr. Daniel Axelrod to see if it resembled any species he knew as a fossil; but he said no, he had nothing like it in his rather extensive collection of the genus. In Arroyo Hediondo it grows with *Pinus muricata* [especially forma *remorata*], which is local in Baja California more than 400 km southeast of its next most southern populations on Santa Cruz and Santa Rosa Islands. Also here is *Ceanothus thyrsoiflorus*, even more

local in Baja California and over 500 km southeast of other populations: otherwise, it occurs in the coast ranges from Santa Barbara Co. to Oregon. According to Chaney and Mason (1954) it is locally more abundant in the discontinuous closed-cone pine forest, and it was with *Pinus remorata* in the Pleistocene flora of Santa Cruz Island. Two other associates of the berberis are confined to coastal northern Baja California (and the first on Isla Cedros) except for more northern occurrences on islands: *Ribes viburnifolium* on Santa Catalina Island and *Salvia brandegei* on Santa Rosa Island. Another relict in Arroyo Hediondo is *Adenothamnus validus*, a rare endemic monotype of coastal northwest Baja California.

Ahrendt (1961) divided *Mahonia* into two groups, four sections, and 15 subsections, with a total of 110 species. (I am unable to evaluate this classification.) Treating the American (and especially the Mexican) species of *Mahonia*, but under *Berberis*, Marroquín (1972) accepted Ahrendt's American subdivisions of *Mahonia* without formally transferring them to *Berberis*. Ahrendt's two groups are (1) the Orientales, of Asia except for *M. nervosa* Pursh in western North America, and (2) the Occidentales, of western North America to Costa Rica. He separated the Orientales chiefly by the long and persistent bud-scales; and on this basis *B. claireae* clearly falls in the Occidentales.

Ahrendt (1961:331), and following him Marroquín, divided the group Occidentales into three sections. From their keys *B. claireae* falls in section Aquifoliatae, of British Columbia to Guatemala; and it agrees in the main with the descriptions. However, it does not agree with any species described.

A striking character of *B. claireae* is the palmate leaflet venation, with 3 or 5 subparallel and nearly equal veins from the base. In other west American species of Occidentales, venation is pinnate - or at most in broader leaflets sometimes varies to subpalmate, with smaller and shorter lateral veins from the base. Venation is palmate also in *B. nervosa* Pursh of central California to British Columbia, the sole American survivor of the group Orientales. That differs sharply from other American species in its large and persistent glumaceous bud scales. It differs from *B. claireae* further in many ways, having larger racemes, flowers, and fruits, and larger leaves with longer petioles and with 7 - 21 larger and more widely spaced leaflets.

Thus, *B. claireae* differs from all other west American species of Occidentales in its leaf venation. To judge from Ahrendt's numbers, which are incomplete but suggestive, it differs from them further in having only two ovules per ovary instead of 3 - 18.

It is hard to place *B. claireae* within the Occidentales. The most similar leaflet venation I have found is in *B. gracilis* Hartw. (subsection Schiedeanae), of northeastern Mexico: the leaflets there are more variable but sometimes are palmately 3 - 5-veined from the base. The leaves are somewhat thinner and are glabrous instead of papillose. As described by Ahrendt (1961:343), the leaves of *B. gracilis* have 2 - 6 pairs of leaflets, the lowest 2 - 4 cm above the

base; leaflets are ovate, 3.5 - 5 cm long, 1.5 - 3 cm wide, with margins 10 - 12-spinose-serrate; racemes are 1 - 3, fascicled, dense, suberect, 3 - 8 cm long; pedicels are 1 - 3 mm long, or to 4 mm in fruit; ovules are (3-) 4 - 5; and berries are 10 - 12 mm long, 5.5 - 7 mm thick, with styles 1 - 1.5 mm long. Thus the plant is quite different.

Dr. Michael Donoghue kindly examined Mexican and central American specimens of *Berberis* at the Harvard University herbaria. He found at least some leaflets with more or less similar venation in *B. longipes* (Standl.) Marroquín, *B. moranensis* (Hebenstr. & Ludw.) I.M. Jtn., *B. nigricans* O. Kuntze, *B. schiedeana* Schlecht., and *B. tinctoria* (Teran & Berl.) Nemo. From his brief comparisons, however, he concluded that on the whole none of these species seemed closer than *B. gracilis* to *B. claireae*. I therefore tentatively nominate *B. gracilis* as next of kin.

If *B. claireae* is indeed closest to species of mainland Mexico, its occurrence on the northwest coast of Baja California seems remarkable. It differs from *B. gracilis* notably in having more coriaceous leaves, a reduced number of leaflets (sometimes only one), and a smaller fruit with only two seeds.

Being far from large herbaria, I am grateful to those who rummaged through *Berberis* folders seeking answers to my questions: Annetta Carter at the University of California at Berkeley, Dr. Michael Donoghue at Harvard University, and Dr. Jerzy Rzedowski at the Instituto Politécnico in Mexico City.

REFERENCES CITED

- Ahrendt, Leslie W.A. 1961. *Berberis* and *Mahonia*: a taxonomic revision. *J. Linn. Soc., Bot.* 57:1 - 410.
- Benson, Lyman, and Robert A. Darrow. 1981. The trees and shrubs of the Southwestern deserts. Ed. 3. Univ. Arizona Press, Tucson.
- Chaney, Ralph W., and Herbert L. Mason. 1934. A Pleistocene flora from Santa Cruz Island, California. *Publ. Carnegie Inst. Wash.* 415:1 - 24.
- Ernst, Wallace R. 1964. The genera of Berberidaceae, Lardizabalaceae, and Menispermaceae in the southeastern United States. *J. Arnold Arbor.* 45:1 - 35.
- Marroquín de la Fuente, Jorge. 1972. A monographic study of the genus *Berberis* L. in Mexico. Ph.D. thesis, Northeastern University, Boston, Mass.
- Munz, Philip A. 1959. A California flora. Univ. California Press, Berkeley.
- _____. 1974. A flora of southern California. Univ. California Press, Berkeley.
- Wiggins, Ira L. 1980. Flora of Baja California. Stanford Univ. Press.